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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/329,156 06/09/99 QU

Z IR-1677

EXAMINER

002352 MM22/0216
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NEW YORK NY 10036-8403

ART UNIT 1

PAPER NUMBER

DATE MAILED: 2811

02/16/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/329,156

Applicant(s)
Qu et al.

Examiner
Shouxiang Hu

Group Art Unit
2811



☒ Responsive to communication(s) filed on Jul 22, 1999

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire three month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) 1-12 is/are pending in the applicat

Of the above, claim(s) _____ is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-12 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☒ The drawing(s) filed on Jun 9, 1999 is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been
☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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DETAILED ACTION

Claim Objections

1. Claims 3 and 4 are objected to because of the following informalities: when used for comparing the thickens, the phrase of "more than" recited in these claims is less appropriate than --thicker than-- or --greater than--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as failing to set forth the subject matter which applicant(s) regard as their invention. In the specification (Page 4, line 14- page 5, line 2), it is disclosed that the second epi layer (20) is doped with higher concentration than in the first epi layer (21). Therefore, the resistivity should be lower in the second epi layer than in the first one.
4. Claims 3-8 and 12 recites the limitation "the same voltage". There is insufficient antecedent basis for this limitation in the claims.

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Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-12 are rejected under 35 U.S.C. 102(b) as being unpatentable over Muramoto (4,884,113).

Muramoto discloses (Figs. 3-8) a semiconductor device comprising: A semiconductor substrate (10a); a N⁻-type first deposited layer (10b); a N⁺-type second deposited layer (the horizontal portion of 12); a plurality of P-type layer (13) on the surface of the second deposited layer and defining p-n junctions therein.

Although Muramoto does not explicitly disclose that the semiconductor substrate is a silicon substrate, it is noted that silicon substrate is the most commonly used semiconductor substrate. Therefore, ordinary skilled in the art would be able to recognize that a silicon substrate can be used as the semiconductor substrate to form Muramoto's semiconductor device.

In addition, although Muramoto does not explicitly disclose which process is used to form the deposited layers, it is noted that it is old and well known in the art that epitaxial deposition is one of the most widely used processes to form semiconductor layers. Besides, the process limitations of "epitaxially deposited" or "separately deposited" recited in claims 1-12 would not carry patentable weight in these claims drawing to a structure, because distinct

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structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985).

Regarding claim 2, the N⁺-type second deposited layer (12) has a resistivity intrinsically lower than the one in the N⁻-type first deposited layer (10b).

Regarding claims 3-8 and 12, Muramoto discloses that higher reverse bias voltage can be obtained with the bi-layer structure. Therefore, Muramoto's device is intrinsically capable of having the total thickness of the first and second layers thinner than the thickness of a single layer designed to block a same voltage.

Regarding claims 9 and 10, Muramoto's device is a vertical DMOS, which is one of the various types of MOSFET and can be used in conduction power applications. The thickness of the bottom portion (10b) is more than 50% of the total thickness of the upper portion (12) and the bottom portion.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References B-D are cited as being related to a vertical MOSFET structure.

8. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax

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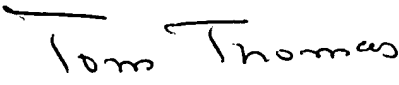
Center number is (703) 308-7722 or 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to ***Shouxiang Hu*** whose telephone number is **(703) 306-5729**. The Examiner is in the Office generally between the hours of 8:00AM to 5:30PM (Eastern Standard Time) Tuesday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **(703) 308-0956**.

Shouxiang Hu

February 4, 2000


Tom Thomas
Supervisory Patent Examiner
Technology Center 2800